SDPS System Scenarios Overview

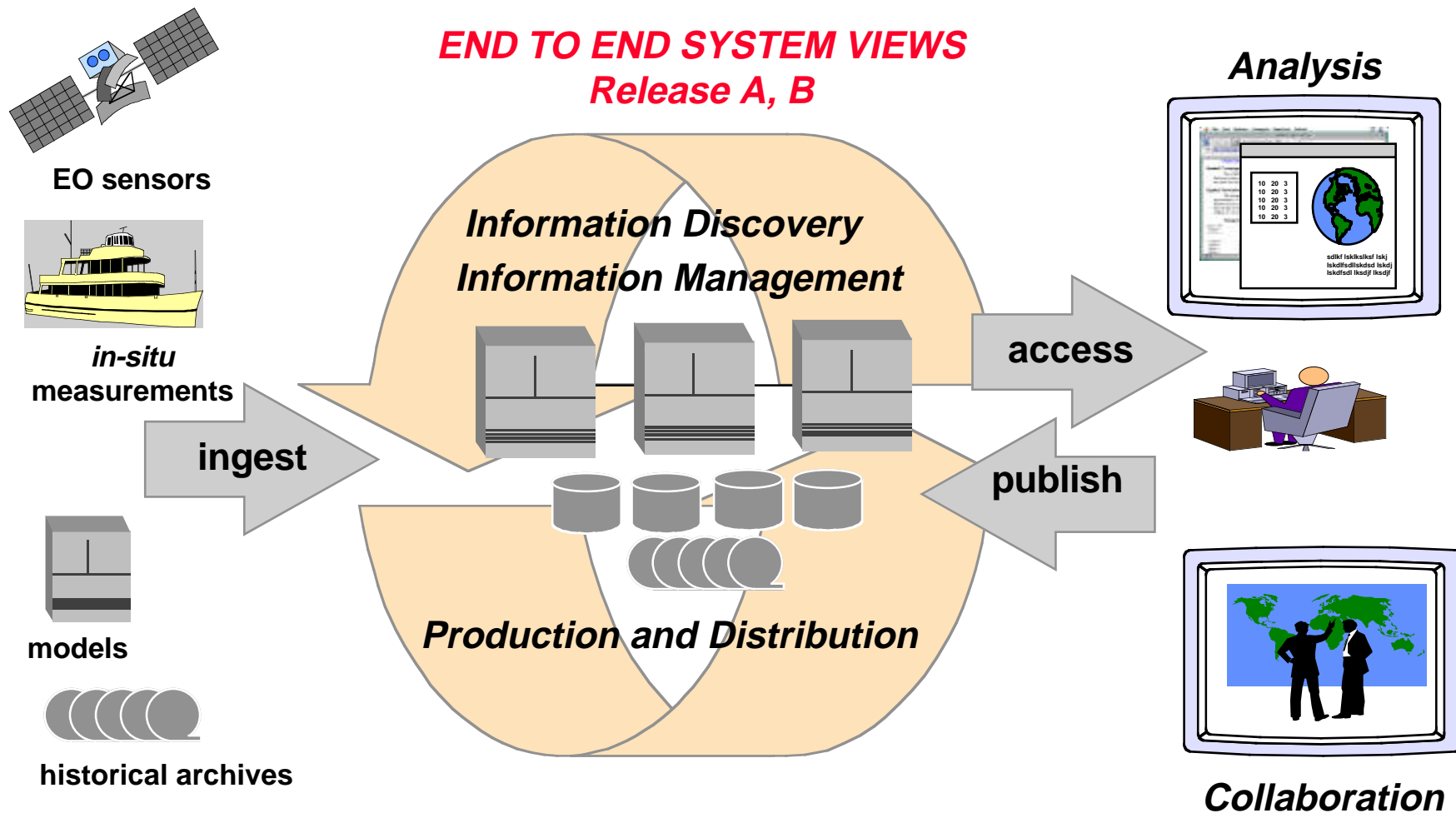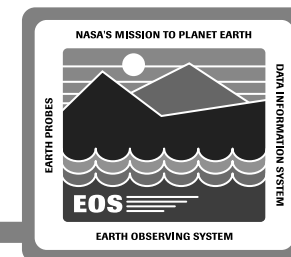## Ron Williamson

13 February 1995

ECS Scenario Context

END TO END SYSTEM VIEWS
Release A, B

Analysis

EO sensors

in-situ
measurements

Information Discovery

Information Management

access

ingest

publish

models

Production and Distribution

historical archives

*Collaboration*

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RW-2

Role of Scenarios
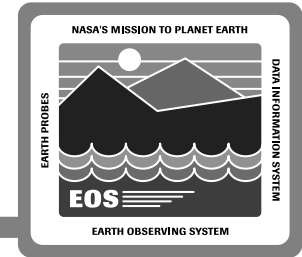
- **System Scenarios**
  - **Dynamic Representation of System**
    - **System Component Interaction**
    - **User View and System View**
      - **Scientists not interested in internal system dynamics**
      - **Developers need static object and dynamic scenario views**
  - **Uses Object Model Vocabulary and Interfaces**
- **Object Model**
  - **Static Representation of System**
  - **Science Domain and System Design Vocabulary**
  - **Science and Design Concept Relationships**
- **Interfaces**
  - **Static Representation of System**
  - **Major System Components: Subsystems and CIs**
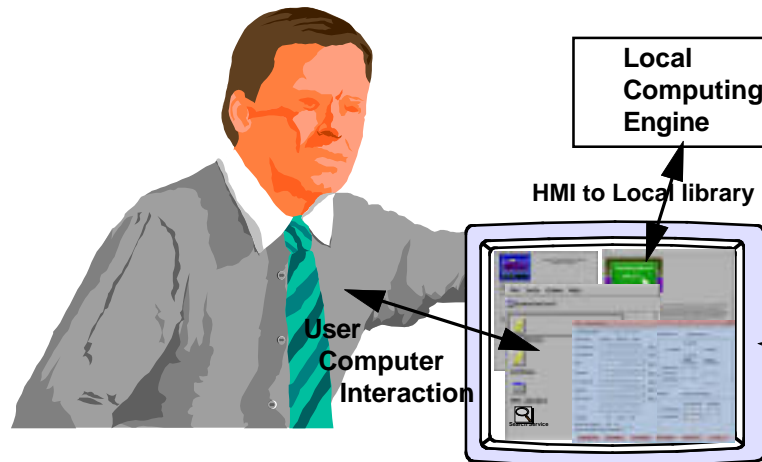 - **Interface Objects Link to Object Model**

Scenario Relationship to User Model
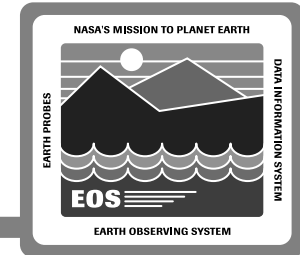
USER MODEL (Scientist and Operations Perspectives)

WHO, WHAT, WHERE, WHY
Explains the types of users, user expectations of
the system, the kinds of research they conduct,
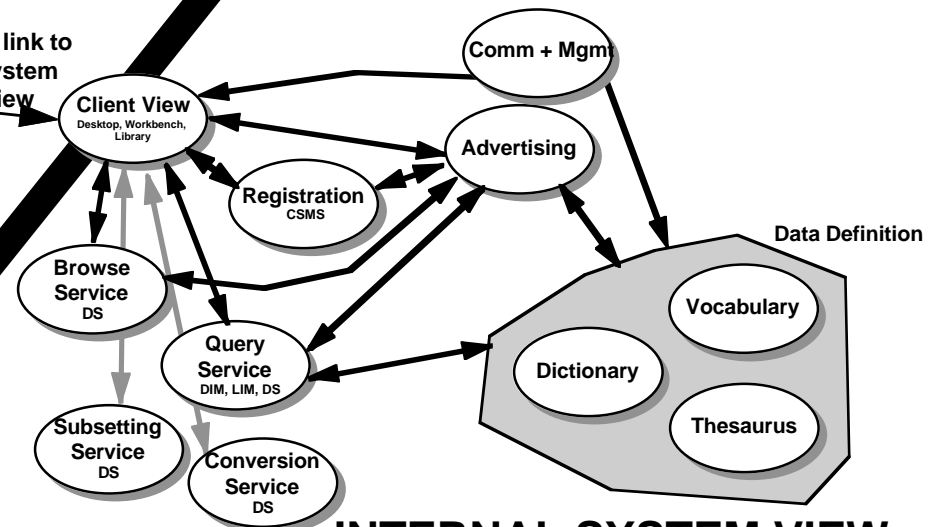and provides examples of science research, queries,
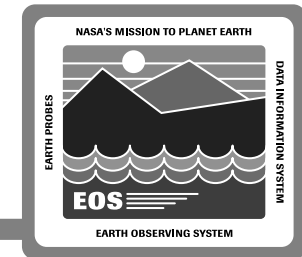and work flow.

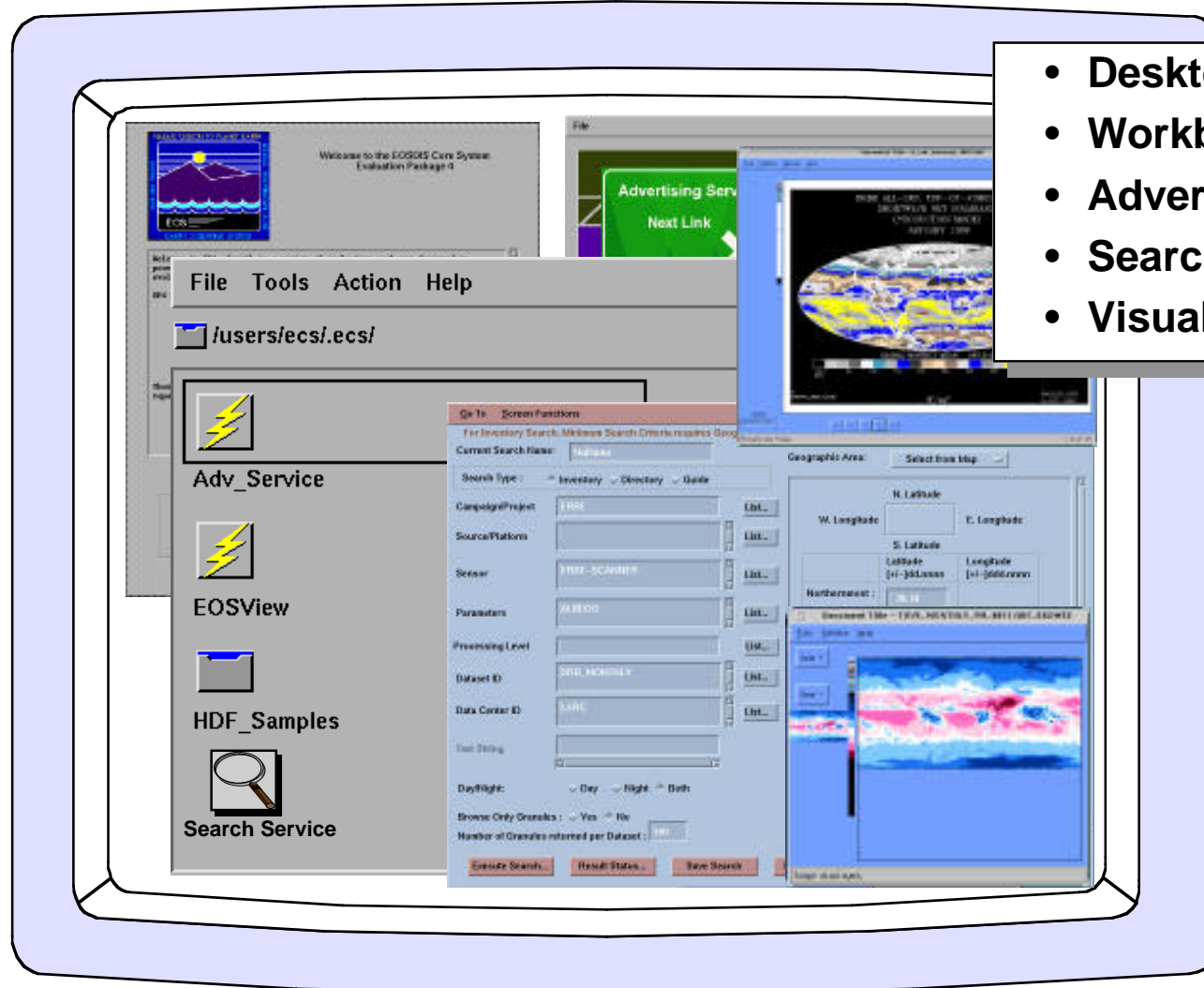## System Boundary

System Model and Scenarios

HOW
Explains what the architectural
components are and how they
work together to satisfy user
service requests.

Local Computing Engine

Service Access

HMI to Local library

API Usage

HMI link to System View

User Computer Interaction

EXTERNAL VIEW

Client View
Desktop, Workbench, Library

Comm + Mgmt

Advertising

Registration
CSMS

Browse Service
DS

Query Service
DIM, LIM, DS

Subsetting Service
DS

Conversion Service
DS

Data Definition

Vocabulary

Dictionary

Thesaurus

INTERNAL SYSTEM VIEW

SDPS External View

- **Desktop**
- **Workbench**
- **Advertising**
- **Search**
- **Visualization**

SDPS Internal System Scenario Views

Scientist View

Instrument Scientist View

Client
(Workbench, Desktop)

Advertising
Data Dictionary

Ingest Clients

Planning

Data Management
(LIM, DDS)

Data Processing

Data Server
(ESDTs +)
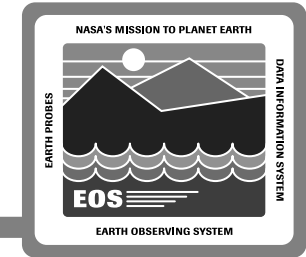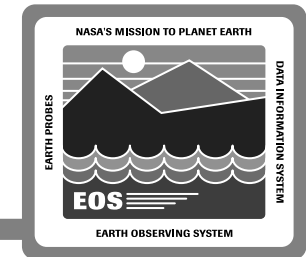
Operations View
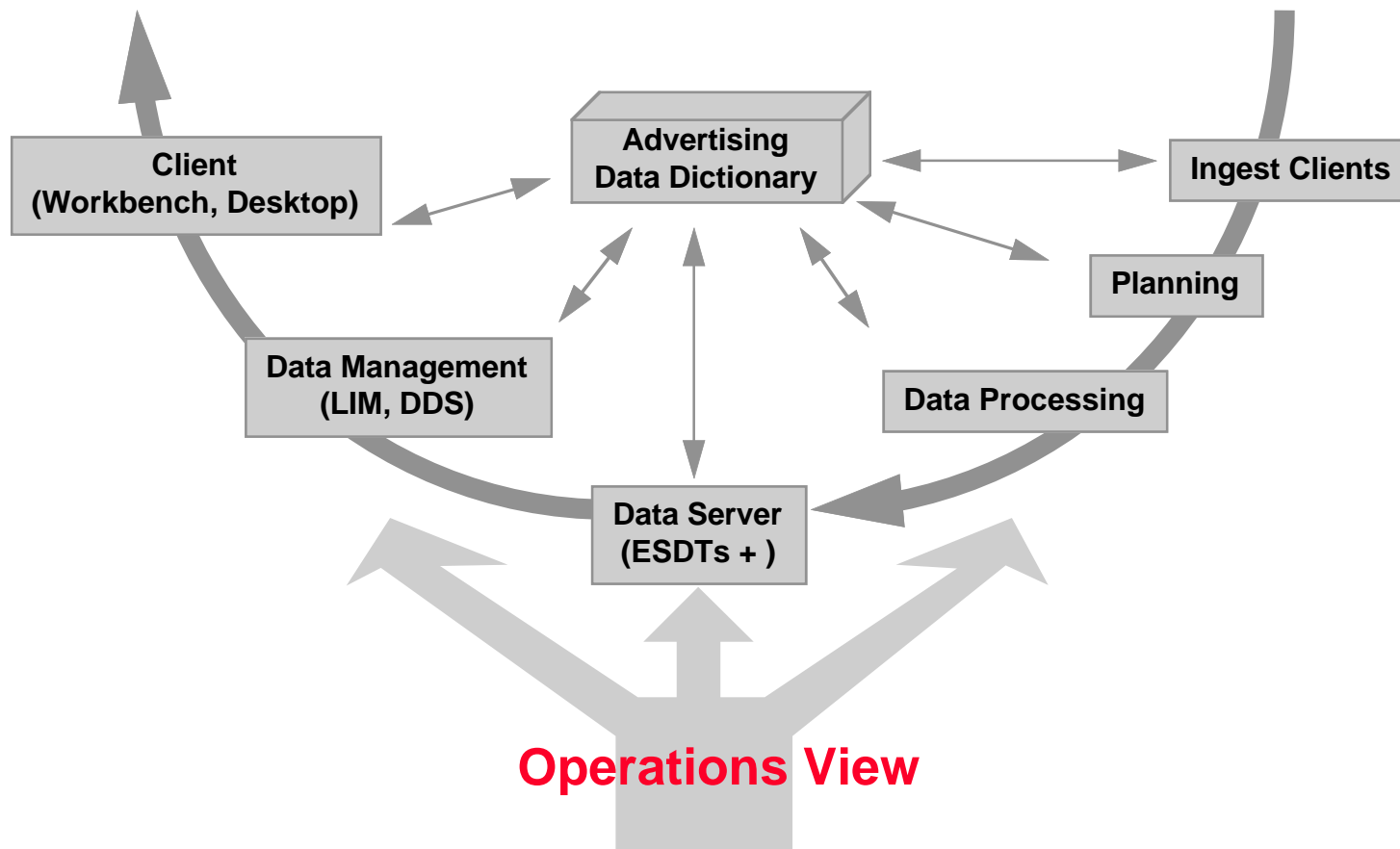
SDPS Scenario Views

- **A   Instrument Scientist View**

  - **Product Planning (Release A and B)**

  - **Instrument Scientist User (Barkstrom Team)**

  - Demonstrate the planning and processing steps for standard productions and reprocessing in Release A and on-demand processing in Release B of CERES product algorithms. (Barkstrom Team).

- **B   Scientist View**

  - **Access by Land Processes User (Release A and B)**

  - **Experienced EOSDIS User (Emery / Baldwin Team)**

  - DEM and AVHRR (Release A) /MODIS/Landsat-7 (Release B) data is combined to create surface models for the scenes of interest and validated with higher resolution Aster data (Release B).

- **C   Operations View**

  - **Data Server Administration (Release A and B)**

  - **DAAC Operations Staff (Internal & External M&O Teams)**

  - Demonstrate the planning, maintenance and operations steps related to data server administration.

Scenario A: Production Planning
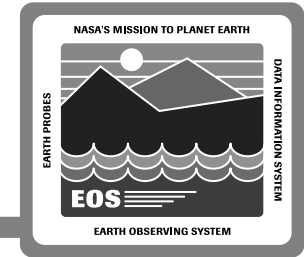
- Release A and B Scenarios for CERES Instrument Scientist (LaRC)

- Earth's Radiation Budget (LaRC)
    - 12 Subsystem Planning and Sequencing of CERES Production
    - Release A Standard Production and Reprocessing
    - Release B On-demand Processing

- The Scenario Includes
    - Planning Process and Instrument Team Interaction
    - Production Status Monitoring
    - Plan Monitoring

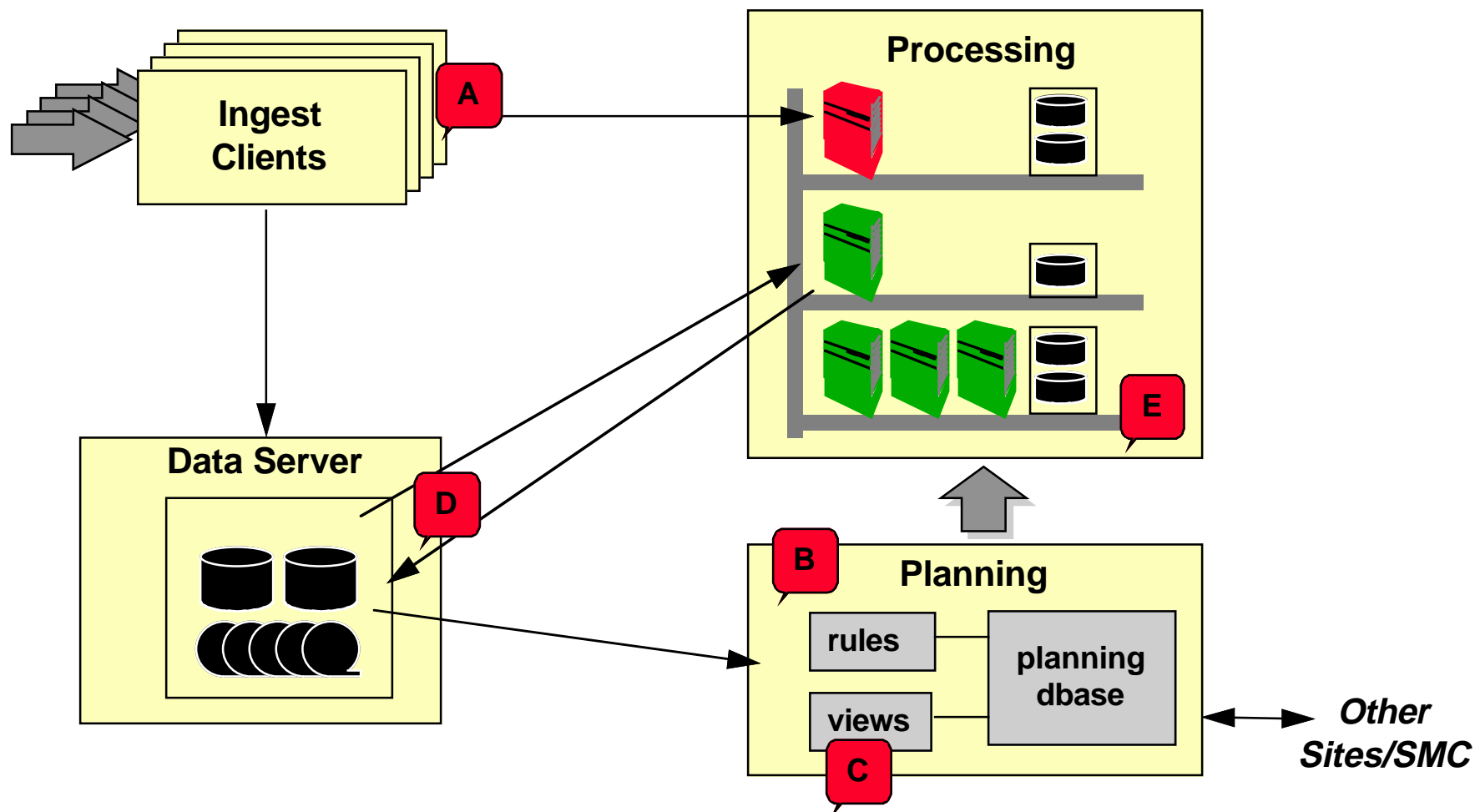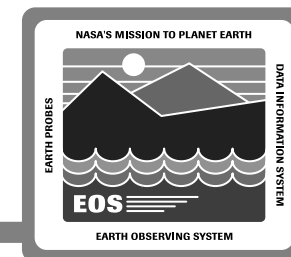- Detailed Scenario Presented (Day 3) in Planning and Data Processing Subsystem Design Presentation and Documents

Scenario A: Science Overview

Instrument Scientist Scenario ("*Instrument team and operations provide inputs to product planning process, monitors production status, plans and schedule*")

Plan analysis and generation with Instrument team peer review.

Generate Integrated Plan for DAAC

Review and Monitor Resulting Plan

1 **Request**

Plan Maintenance

2 DAS, Request, Plan Analysis

3 **Candidate Plan Generation**

4 Analyze + Mod Plan

5 **DAAC Activation Plan Management**

DAAC Instr. Team Coord

Monitor Progress **8**

6 Instrument Team Review

Strawman Plan Analysis

7 DAAC Coord

Review and Coordination

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RW-9

Scenario A: Science Overview Flow

1. User Enters Standard Production Request and Production Scheduler Notified

2. DAS for SDPF Available and Viewable

3. Production Scheduler Initiates Creation of Candidate Plan

4. Production Scheduler Views Plan

5. Production Scheduler Views PGE Profile

6. Instrument Team Reviews Strawman Plan

7. Instrument Teams and DAAC Operation Staff Coordinate Plan Activation

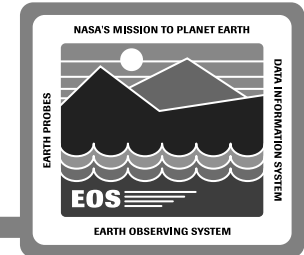8. DAAC Operations Staff and Instrument Team Monitor Progress

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Scenario A: Science Overview

NASA'S MISSION TO PLANET EARTH
EARTH PROBES
DATA INFORMATION SYSTEM
EOS
EARTH OBSERVING SYSTEM

Ingest Clients

A

Processing

E

Data Server

D

B Planning

rules

views

C

planning dbase

Other Sites/SMC

705-CD-002-001

RW-11

Scenario A: Key Features

A   **Instrument Team Provides Inputs to Planning Process**

         Naming Convention Differences

         Ingest Push and Pull Models

B   **Configuration Management of Planning is Automated**

C   **Consistent Views of Plans Maintained**

         Schedule for Product Release

         Plans and Schedules
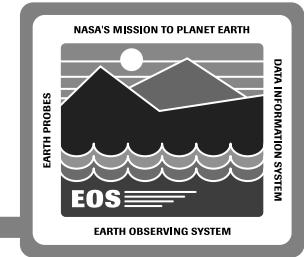
         Plan and Schedule Updates

D   **Toolkit Interface to Data Server Services is Consistent with Design**

E   **Parallel Planning (QA) and Processing (AI&T) Activities**

Scenario B: Science, Theory and Method

- **SCIENCE**
  - Process AVHRR reflected channel data, create "super resolved" model of surface albedo
  - Use super resolved albedo models to create high resolution NDVI composites
  - Used to determine surface type heterogeneity within an AVHRR pixel

- **THEORY**
  - Repeat 1km AVHRR data are non-coincident
    - Centers of repeat FOVs wander over a specified grid box
    - Each repeat measurement contains different feature information within grid
  - Bayesian maximum posterior estimates used
    - Deconvolve differences from multiple repeat AVHRR data sets
    - Reconstruct surface data at resolution higher than individual AVHRR measurements

- **METHOD**
  - Use a high resolution (180m) DEM in conjunction with solar and satellite viewing geometry to create a constant albedo model of the satellite measured illumination
  - Register FOVs from multiple AVHRR data sets to model grid, integrate model values over AVHRR point spread function to give model estimate of reflectivity
  - Use Bayesian theory to determine corrections to the constant albedo values which best estimate AVHRR measured reflectivities
  - Result is reconstructed albedo on 180m grid, verified with Landsat TM data
  - Assume surface characteristics are static over accumulation period of data

Scenario B: Development and Production Stages
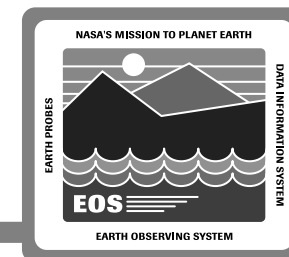
- **DEVELOPMENT (Release A) STAGE**
  - Select development region -- Requirements are : 1) availability of high resolution DEM, 2) relatively static surface features, 3) moderate topography, 4) infrequent cloudiness
  - Determine accumulation period -- Based on availability of cloud free Landsat TM scene for verification and availability of cloud free AVHRR data, close to nadir.
  - Region selected is 1 x 1 degree region in Death Valley, time period 04/01/92 - 06/01/92.

- **DATA REQUIREMENTS FOR DEVELOPMENT STAGE**
  - 90 meter DEM (later degraded to 180m).
  - 2 cloud free TM scenes over region, preferably in early April and late May 1992.
  - 20 AVHRR data sets, level 1 or 2, reflectivity or albedo, bands 1 and 2, minimal cloud contamination, within 20 degrees scan angle of nadir, early afternoon pass.
  - Any other data describing surface characteristics of region: albedo, surface types, vegetation, etc.
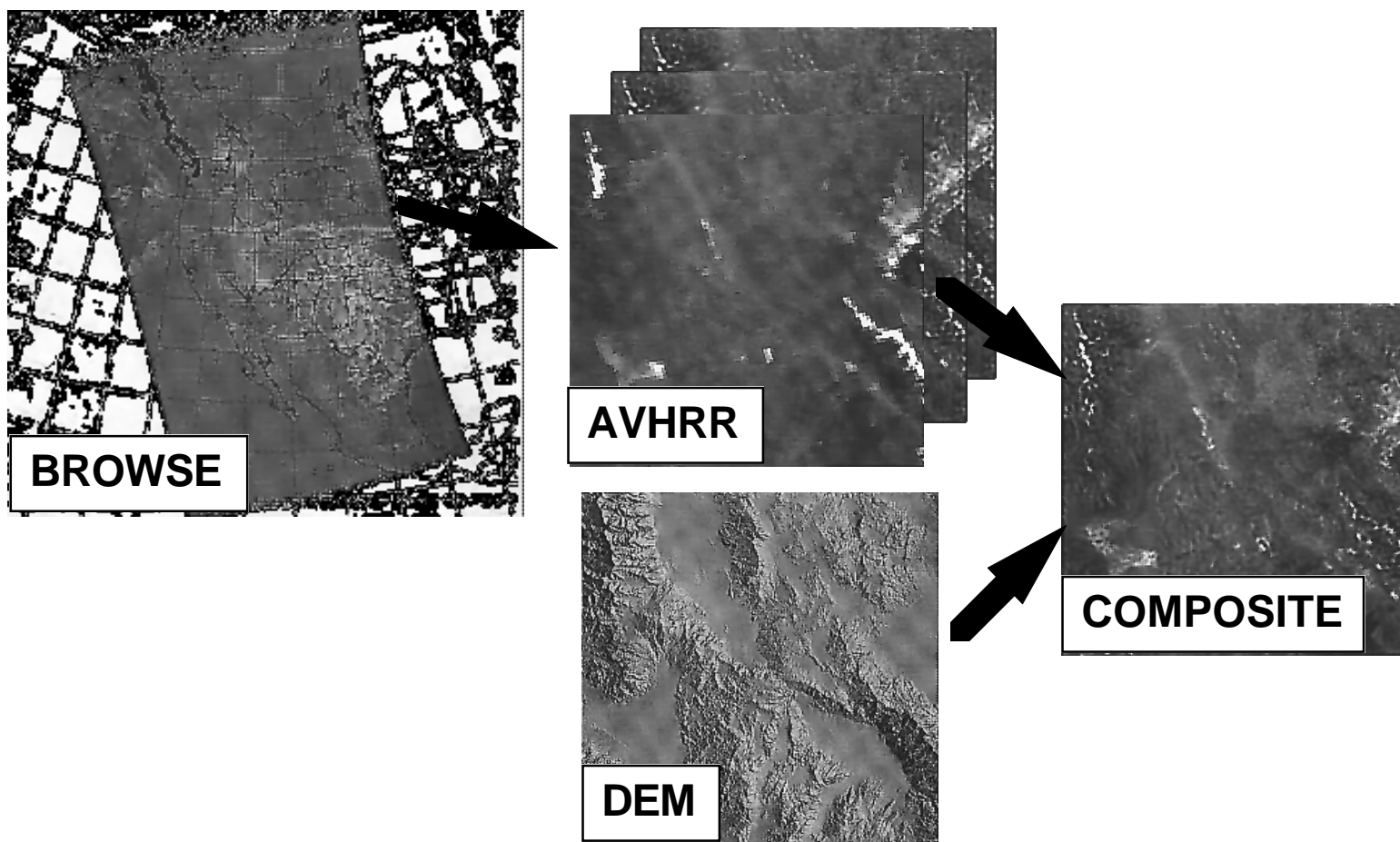
- **EOS ERA (Release B) PRODUCTION STAGE**
  - Use MODIS data instead of AVHRR
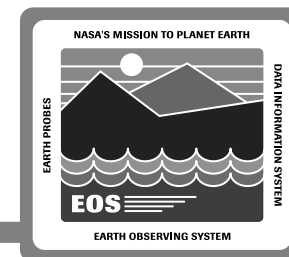 - Verify composite with high resolution ASTER

Scenario B: Science Overview
Release A
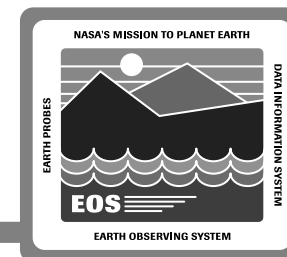
1km AVHRR[13] + 180 m DEM = 180m COMPOSITE

BROWSE

AVHRR

DEM

COMPOSITE

Scenario B: Science Flow Release B

NASA'S MISSION TO PLANET EARTH

EARTH PROBES

DATA INFORMATION SYSTEM

EOS

EARTH OBSERVING SYSTEM
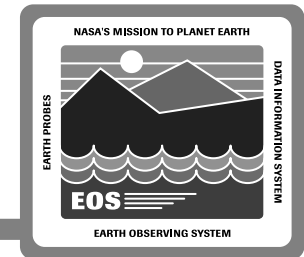
① Search Service Used for Landsat-7, Results Returned & Selection Made

② User Views Query Results, Selects Granules

③ User Inspects Image

④ User Request Full granule of each selected image

⑤ Data Received at Local Workstation

⑥ Search Advertisements for DEM Providers

⑦ Retrieve DEM Fragments and Deliver to User

⑧ User using Advertising to Access MODIS Level 1B Service Provider

⑨ Search for MODIS Data

⑩ MODIS Data Received at Local Workstation

⑪ User Analyzes Landsat, MODIS and DEM to Create Surface Model

⑫ User Defines private 'user method' at local workstation (Release A + B)

⑬ User issues a standing request to obtain data for 10 day intervals (Rel A+B)

⑭ User establishes request for cloud-free ASTER scenes

⑮ User receives requested data and stores in local archive

Scenario B: Design Overview
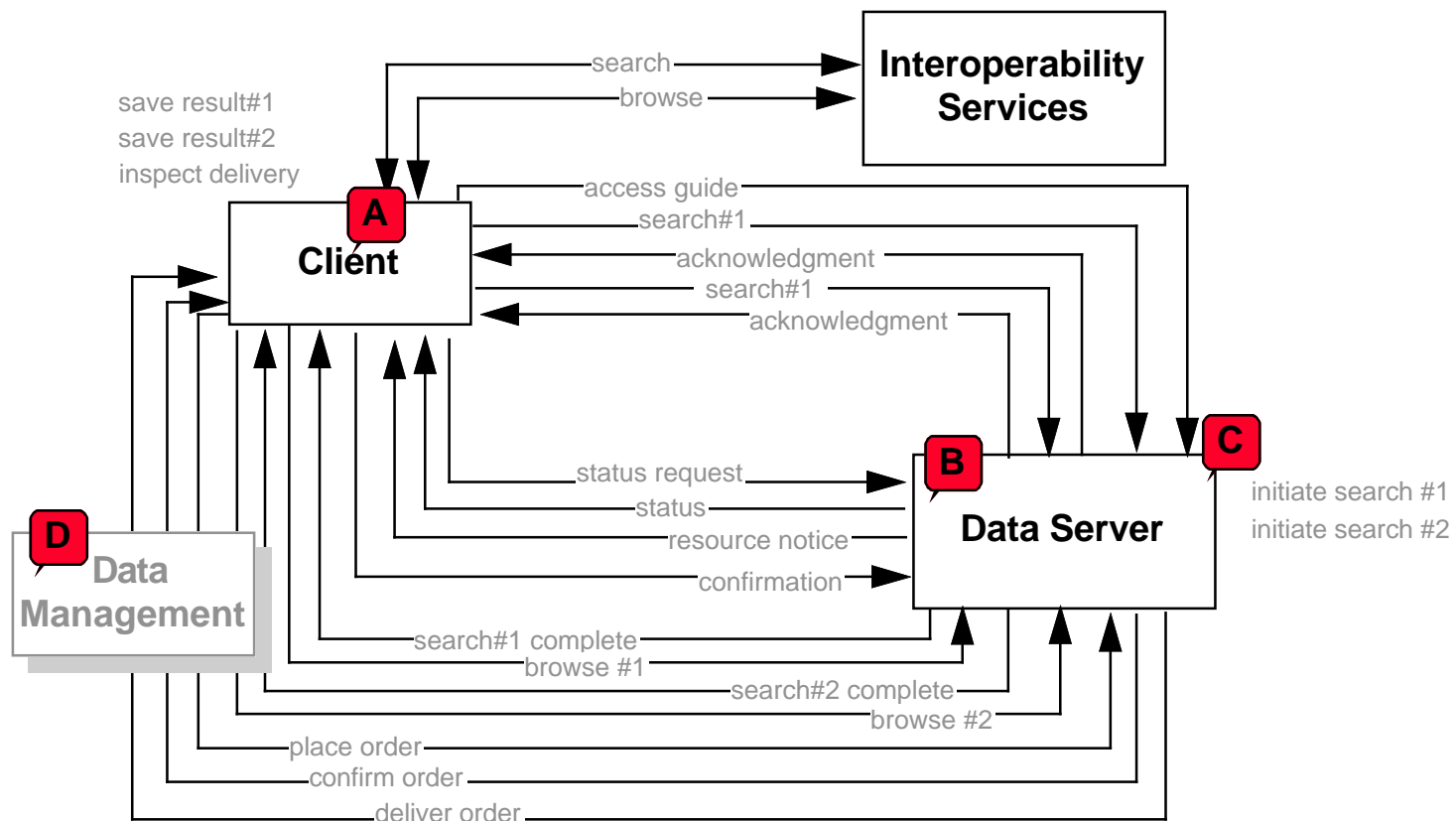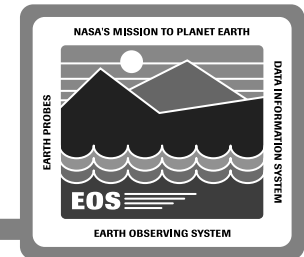
Scenario B: Key Features
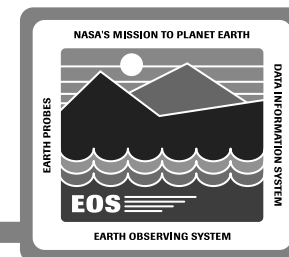
A **V1 Desktop and Workbench Integrates ECS and V0 Services**

- Search, Advertising, and Data Definition Services
- Data Server Type Services for Search & Access at Release A
- Data Server Type Services for Subsetting at Release B

B **V0 Search Service used to access V0 servers and ECS Data Servers**
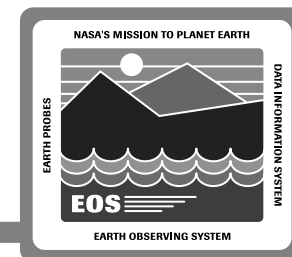
C **WWW access to Document Data Server**

**D** **Integrated Site View at Release B**

Scenario C: Data Server Admin

- **Release A and B Scenarios for Data Server Administration**

- **Earth's Radiation Budget (LaRC)**
    - **Product Specific Model In CERES Data Modeling Documents**

- **The Scenario Includes**
    - **Develop Data Server Model**
    - **Load Test Data**
    - **Verify Operations**

- **More Detailed Scenario Information Available in**
    - **Data Server Subsystem Documents and Presentation**
    - **DAAC Operations Presentation**
        - **Operations Scenarios - A Day in the Life of a Release A DAAC presentation**
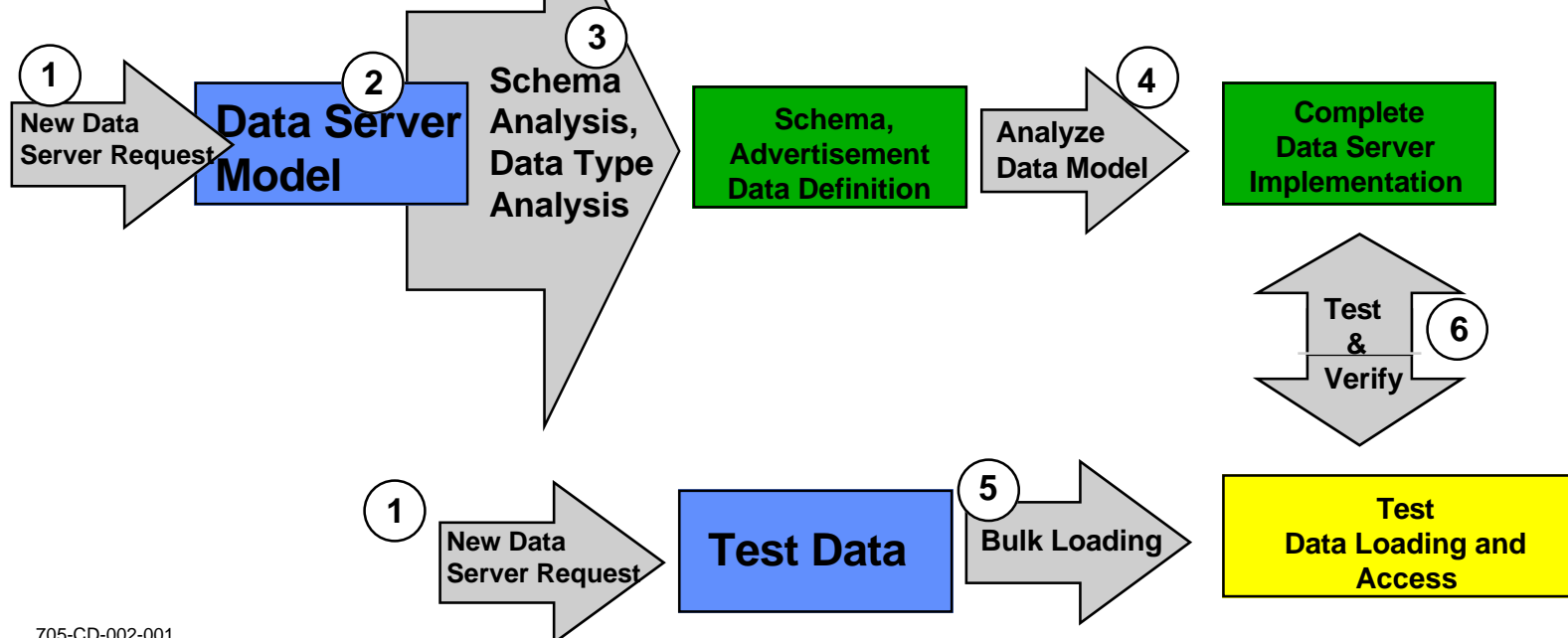
Scenario C: Operations Overview
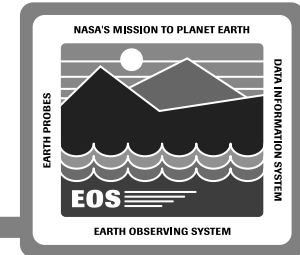
Operations Scenario ("*Set up a Data Server, analyze the process of building and integrate a new Data Server into the Data Management* ")
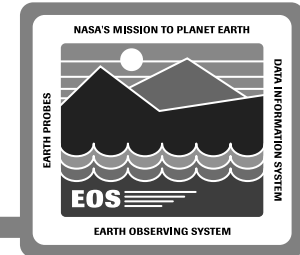
Implement data server administration and operations services to develop a data server model, load test data, and verify operations

Generate Data Model Components

Test Data Server Functionality

(1) New Data Server Request → **(2)** Data Server Model → **(3)** Schema Analysis, Data Type Analysis → Schema, Advertisement Data Definition → Analyze Data Model → **(4)** Complete Data Server Implementation

Test & Verify **(6)**

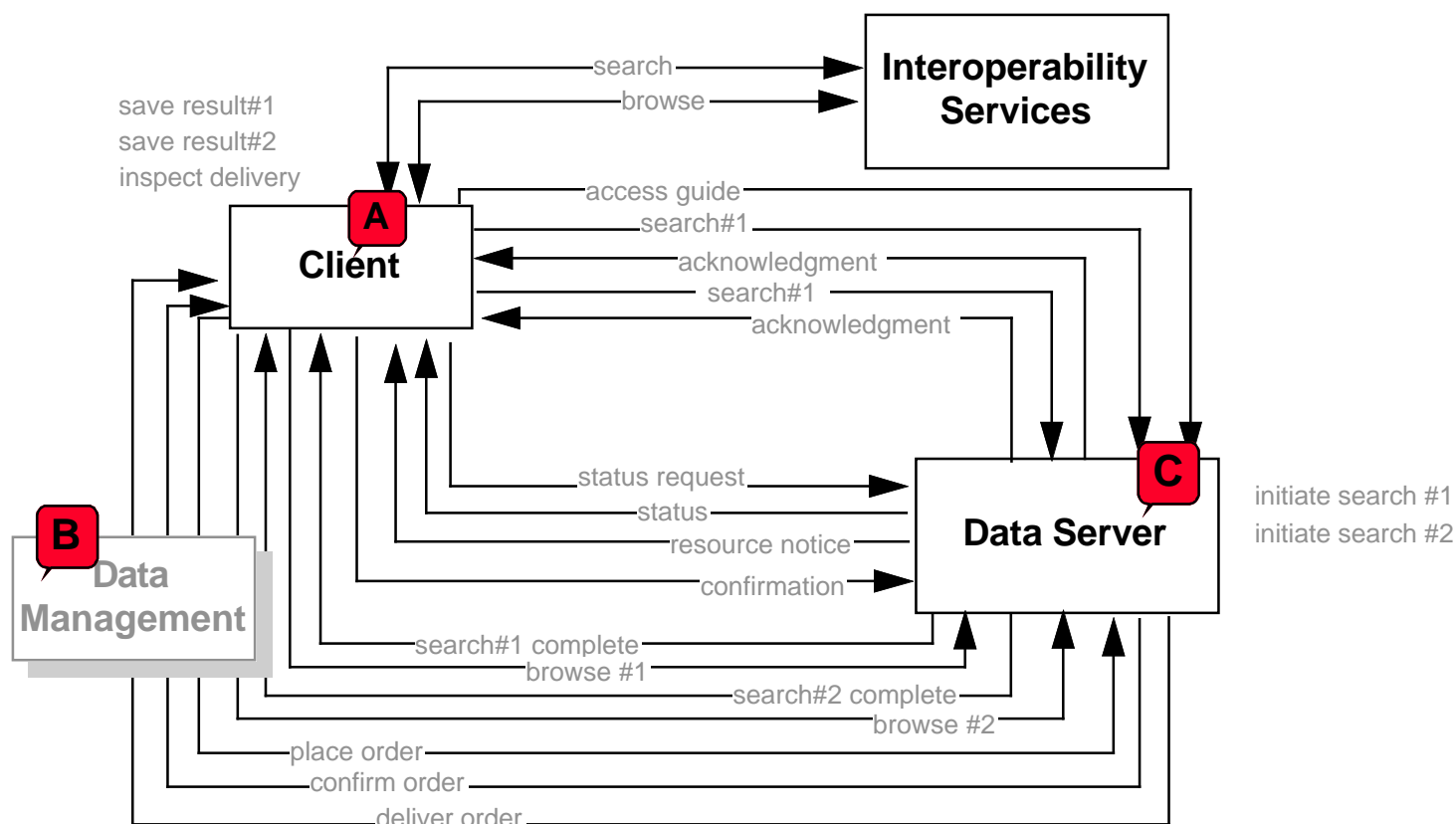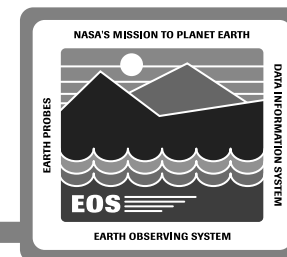**(1)** New Data Server Request → Test Data → **(5)** Bulk Loading → Test Data Loading and Access

Scenario C: Data Server Admin Flow

1. **Administrator Receives New Data Server Request and Gathers Data Server Characterization and Test Data**

2. **Administrator Checks Validity of Data Type Definitions, Schema Consistency, Site Unique Extensions**

3. **Administrator Analyzes Schema and Data Type Views and Creates Internal and Export Schemas, Advertisements, and DBMS, Files System and Archive Linkages**

4. **Administrator Checks Complete Data Server Logical and Physical Data Models for Consistency and Completeness**

5. **Operator Bulk Loads Test Data and Verifies Content of Data Server**

6. **Operator and Administrator Integrates and Tests Data Server Components for Full Operational Test**
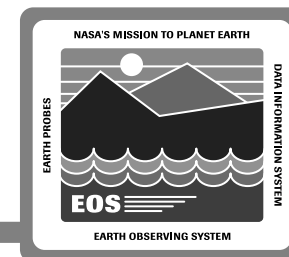
Scenario C: Design Overview

Interoperability Services

search
browse

save result#1
save result#2
inspect delivery

A
Client

access guide
search#1
acknowledgment
search#1
acknowledgment

B
Data Management

C
Data Server

initiate search #1
initiate search #2

status request
status
resource notice
confirmation

search#1 complete
browse #1
search#2 complete
browse #2

place order
confirm order
deliver order

Scenario C: Key Features

A **Online Support for Administration and Operations Services**

- **Configurable User Interface**
- **Common Access to all Services**

B **Online Support for Data Management & Advertising Integration**

- **Schema Export, Integration and Test within LIM**
- **Data Dictionary Term Definition Export and Test**
- **Advertisement Generation and Test**

C **Online Support for Data Server Operational Testing**

- **Bulk Loading of Test Data**
- **Data Access Test Utilities**